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TEST REPORT

Report No.: 24120687HKG-003

Dyson Inc

Application For Certification
(Original Grant)

FCC ID: QVHHS09001

Hair Styler

This report contains the data of RFID only

Prepared and Checked by:	**Approved by:**
Signed On File Leung Chun Ning, Peter Assistant Engineer	Digitally signed by Herbert Wong Location: Intertek Testing Services Hong Kong Limited Wong Cheuk Ho, Herbert Assistant Manager Date: February 03, 2025

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GENERAL INFORMATION

Grantee:	Dyson Inc
Grantee Address:	1330 W Fulton St, 5th Floor, Chicago IL 60607, United States.
FCC Specification Standard:	FCC Part 15, October 1, 2023 Edition
FCC ID:	QVHHS09001
FCC Model(s):	HS09
Type of EUT:	Transceiver
Description of EUT:	Hair Styler
Brand Name:	dyson
Date of Sample Submitted:	December 17, 2024
Date of Test:	December 17, 2024 to January 06, 2025
Report Date:	February 03, 2025
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15. This report contains the data of RFID only

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SUMMARY OF TEST RESULT

Test Specification	Reference	Results
Transmitter Power Line Conducted Emissions	15.207	Pass
Transmitter Field Strength Frequency Stability	15.225	Pass
Radiated Emission Radiated Emission on the Bandedge	15.209	Pass
Radiated Emission in Restricted Bands	15.205	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2023 Edition

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the pervisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

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1.0 GENERAL DESCRIPTION

1.1 Product Description

The Equipment Under Test (EUT), is a 2.4GHz Bluetooth BLE (1Mbps) Transceiver and a 13.56MHz RFID device for a hair styler. For the BLE mode, the sample supplied operated on 40 channels, normally at 2402 – 2480MHz. The channels are separated with 2MHz spacing. For the RFID mode, the sample supplied operated on a single channel, 13.56MHz.

The EUT is powered by 120VAC. After switching on the EUT, it can be paired up with a smartphone and different status and settings can be viewed through a mobile app. After placing different RFID tag at the tip and switching on the EUT, air with different strength and temperature will be exhausted based on the buttons pressed on the hair styler.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: Descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver (RFID Portion).

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in an 3m Chamber. Preliminary scans were performed in the 3m Chamber only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the “Justification Section” of this Application.

1.4 Test Facility

The 3m Chamber and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong SAR, China. This test facility and site measurement data have been placed on file with the FCC and IC No. 2042H.

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2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The device was powered by 120VAC.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. For maximizing emission at and above 30 MHz, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step-by-step procedure for maximizing emissions led to the data report in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

The EUT Exercise program (Direct Test Mode v2.1.0) used during radiated testing was designed to exercise the various system components in a manner similar to a typical use.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Measurement Uncertainty

Decision Rule for compliance: For FCC/IC standard, the measured value must be within the limits of applicable standard without accounting for the measurement uncertainty. For EN/IEC/HKTA/HKTC standard, conformity rules will be used as per standard directly excepted EN/IEC 61000-3-2, EN/IEC 61000-3-3, HKTA1004, HKCA1008, HKTA1019, HKTA1020, HKTA1041 and HKTA1044.

2.5 Support Equipment List and Description

Not Applicable.

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3.0 EMISSION RESULTS

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG - AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

RR = 18.0 dBµV
LF = 9.0 dB

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

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3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 192.718 MHz

For electronic filing, the worst-case radiated emission configuration photographs are saved with filename: Setup Photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 11.5 dB

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RADIATED EMISSIONS

Model: HS09
Date of Test: January 06, 2025
Worst-Case Operating Mode: Transmitting

Table 1
Pursuant to FCC Part 15 Section 15.225 Requirement

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Distance Factor (-dB)	Calculated at 30m (dBµV/m)	Limit at 30m (dBµV/m)	Margin (dB)
O	13.560	58.6	0	10.8	69.4	40.0	29.4	84.0	-54.6
O	27.120	11.5	0	9.5	21.0	40.0	-19.0	29.5	-48.5

NOTES:
1. Quasi-Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Negative sign in the column shows value below limit.
4. Loop antenna is used for the emissions below 30MHz.
5. Emission within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

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Model: HS09
Date of Test: January 06, 2025
Worst-Case Operating Mode: BLE and RFID Operating

Table 2
Pursuant to FCC Part 15 Section 15.209 Requirement

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	34.001	31.7	16	10.0	25.7	40.0	-14.3
V	51.098	27.5	16	11.0	22.5	40.0	-17.5
V	141.308	33.0	16	14.0	31.0	43.5	-12.5
V	192.718	32.0	16	16.0	32.0	43.5	-11.5
H	430.368	19.1	16	25.0	28.1	46.0	-17.9
H	471.229	19.7	16	26.0	29.7	46.0	-16.3

NOTES:
1. Quasi-Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Negative sign in the column shows value below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

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3.4 AC Power Line Conducted Emission

☐ Not Applicable – EUT is only powered by battery for operation.

☒ EUT connects to AC power line. Emission Data is listed in following pages.

☐ Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

3.4.1 AC Power Line Conducted Emission Configuration

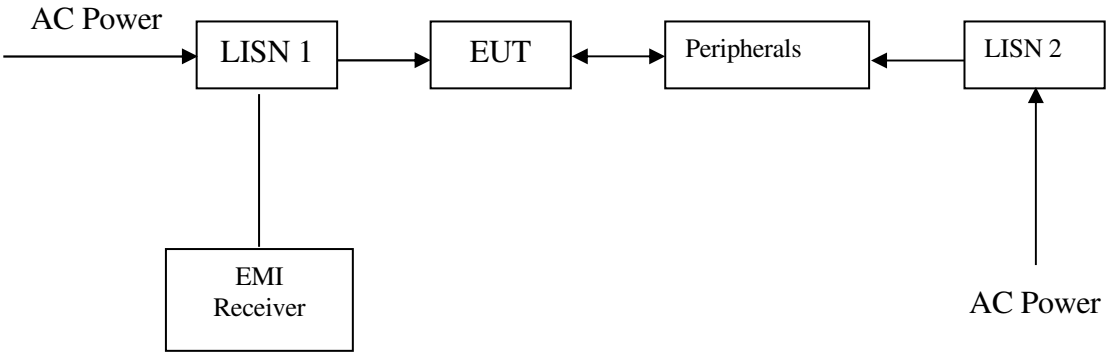
For electronic filing, the worst-case line-conducted configuration photographs are saved with filename: Setup Photos.pdf.

3.4.2 AC Power Line Conducted Emission Data

The plot(s) and data in the following pages list the significant emission frequencies, the limit and the margin of compliance.

Passed by over 20 dB margin

3.4.3 Conducted Emission Test Setup



The EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

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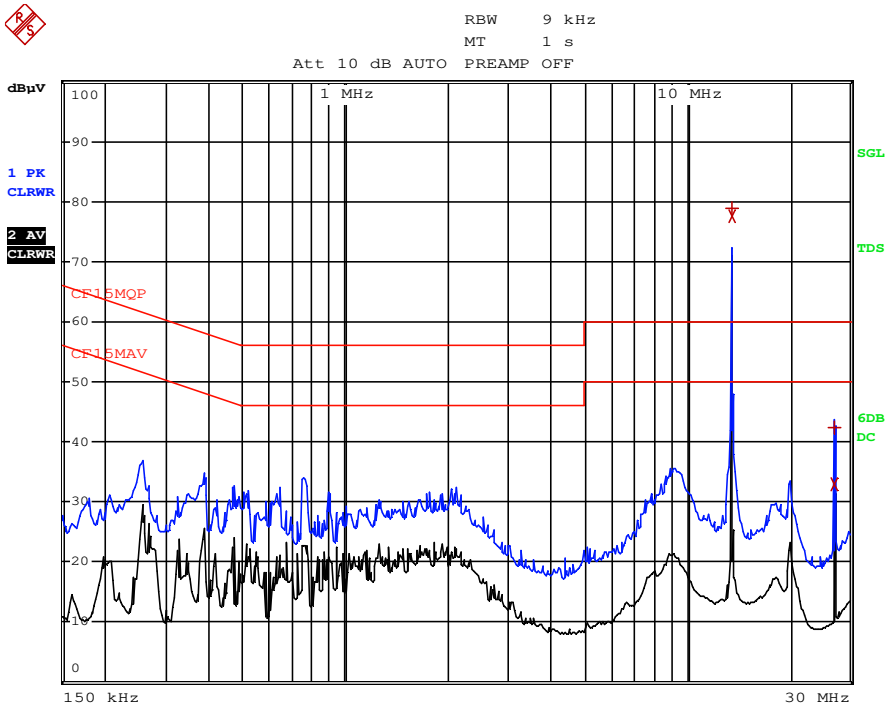
AC POWER LINE CONDUCTED EMISSION

Worst Case: Transmitting (with antenna installed)



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	13.56 MHz	78.85	N	18.85
2	CISPR Average	13.56 MHz	77.65	N	27.65
1	Quasi Peak	27.1185 MHz	42.36	L1	-17.63
2	CISPR Average	27.1185 MHz	32.92	L1	-17.07

NOTES:
1. Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.
2. The AC line conducted tests with the antenna attached were performed to determine if the EUT complies with the 15.207 limits outside the transmitter's fundamental emission band.

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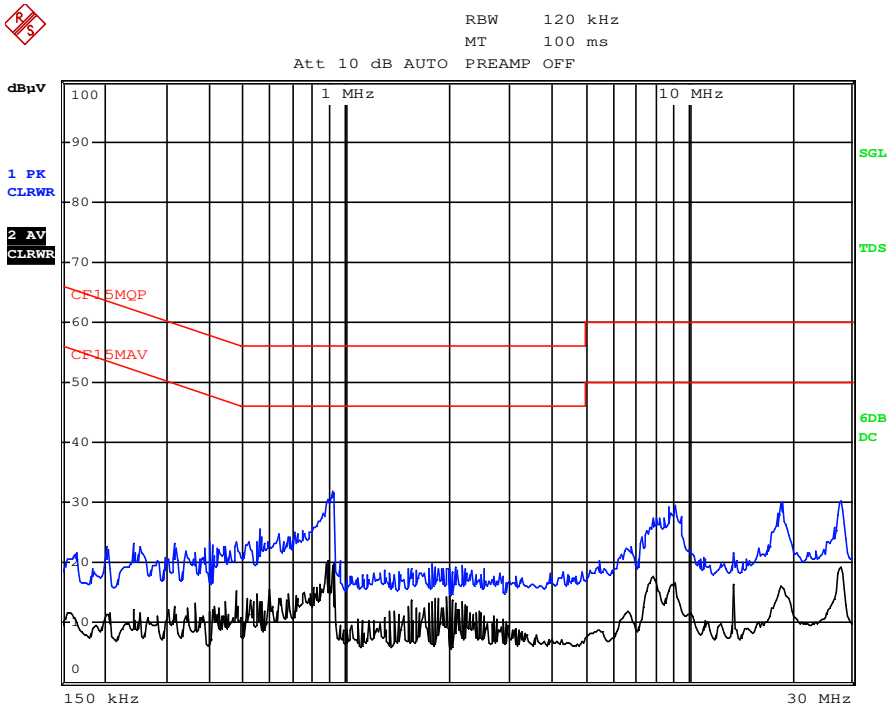
AC POWER LINE CONDUCTED EMISSION

Worst Case: Transmitting (with dummy load in place of antenna)



NOTES:
1. Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.
2. The AC line conducted tests with the antenna attached were performed to determine if the EUT complies with the 15.207 limits outside the transmitter's fundamental emission band.

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3.5 Frequency Stability

FCC Part 15 Section 15.225

Data Table
Frequency Deviation with Voltage Variation

Operating frequency		13.560028MHz		
Test Voltage (V)	Temperature (°C)	Measured frequency (MHz)	Frequency error (%)	Limit (%)
120	+ 50	13.559896	-0.0009734	±0.01
	+ 40	13.559936	-0.0006785	±0.01
	+ 30	13.560008	-0.0001475	±0.01
	+ 20	13.560028	0	±0.01
	+ 10	13.560104	0.0005605	±0.01
	0	13.560136	0.0007965	±0.01
	- 10	13.560124	0.0007080	±0.01
	- 20	13.560144	0.0008555	±0.01
102	+ 20	13.560016	-0.0000885	±0.01
138	+ 20	13.560044	0.0001180	±0.01

The device is deemed to comply with the requirement of FCC15.225(e). Data was taken for different time durations, when the EUT just reached the required temperature at startup, after 2 minutes, after 5 minutes and after 10 minutes. Only the worst-case data is shown in the above table.

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4.0 EQUIPMENT PHOTOGRAPHS

For electronic filing, the photographs are saved with filename: External Photos.pdf and Internal Photos.pdf.

5.0 PRODUCT LABELLING

For electronics filing, the FCC ID label artwork and the label location are saved with filename: Label.pdf.

6.0 TECHNICAL SPECIFICATIONS

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: Block.pdf and Circuit.pdf respectively.

7.0 INSTRUCTION MANUAL

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: Manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

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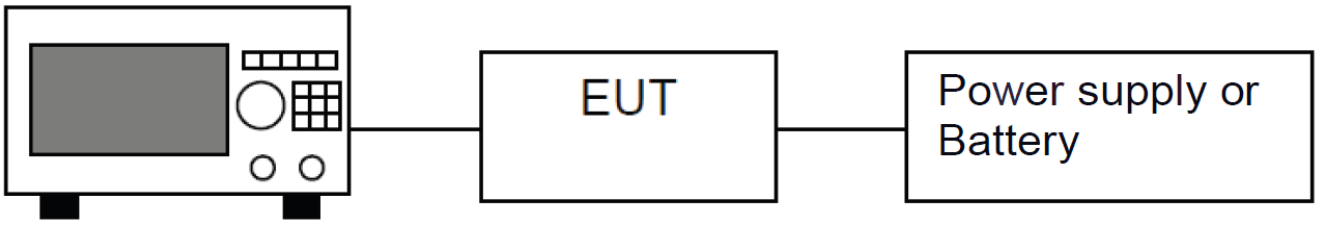
8.0 MISCELLANEOUS INFORMATION

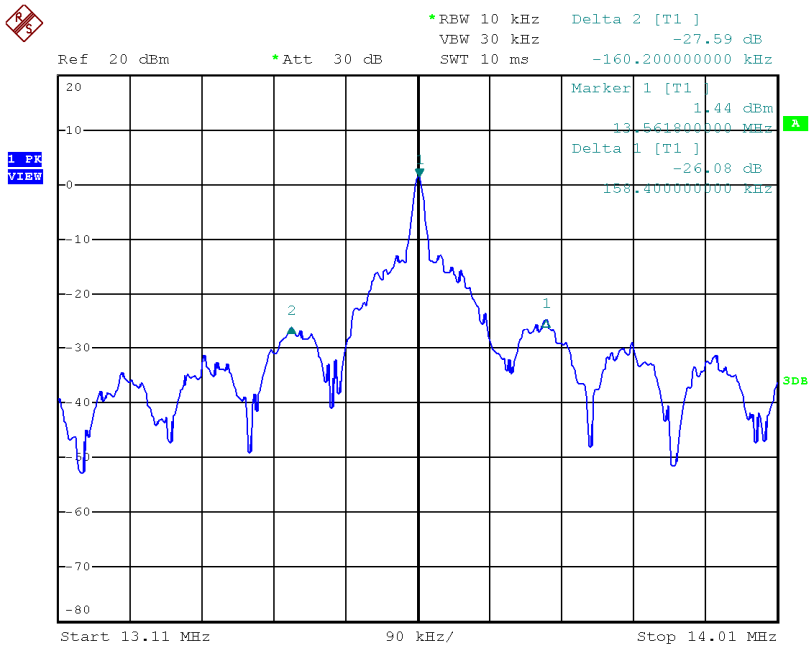
The miscellaneous information includes details of the test procedure and measured bandwidth.

8.1 Measured Bandwidth

The following graph shows the fundamental emission is confined in the specified band. The emission of the fundamental is 29.4 dBµV/m and it is below the limit of 50.5 dBµV/m in the range of (13.410-13.553MHz) and (13.710-14.010MHz) and the limit of 40.5 dBµV/m in the frequency range of (13.110-14.410MHz) and (13.710-14.010MHz). In the frequency range from 13.110-14.010MHz, we cannot find any emission higher than the fundamental emission. Therefore, they meet the requirement of Section 15.225(a), (b), (c), & (d).



Block diagram of Test setup



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8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

8.3 Calculation of Average Factor

N/A

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8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.10 (2013).

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

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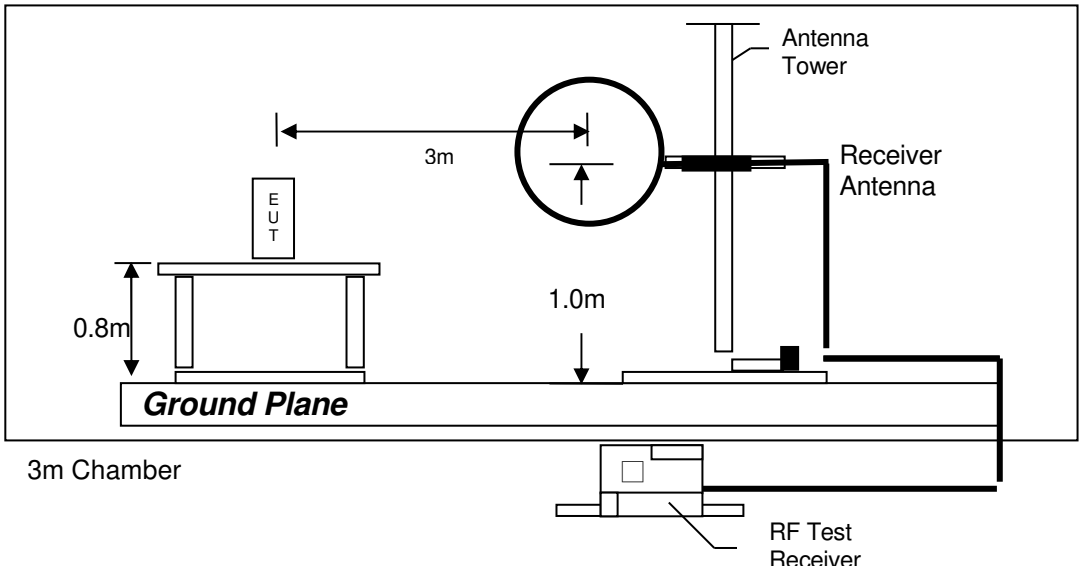
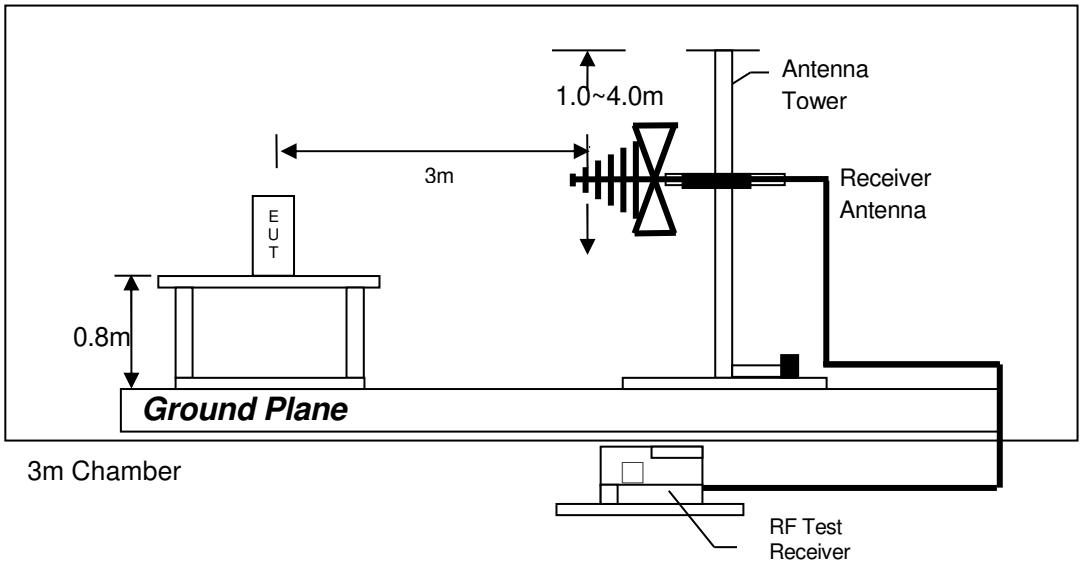
8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions 9kHz to 30MHz



Test setup of radiated emissions 30MHz to 1GHz

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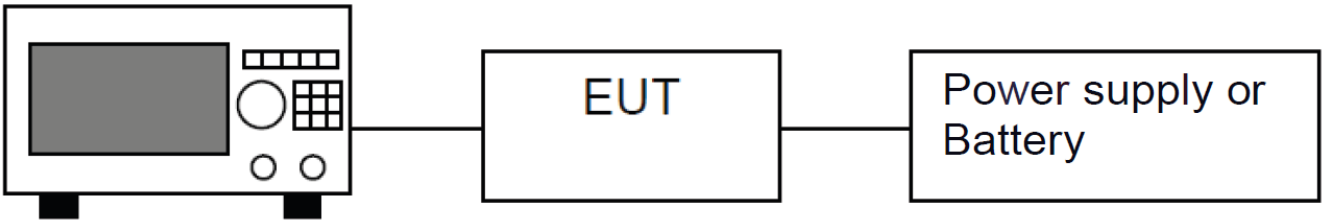
8.5 Occupied Bandwidth

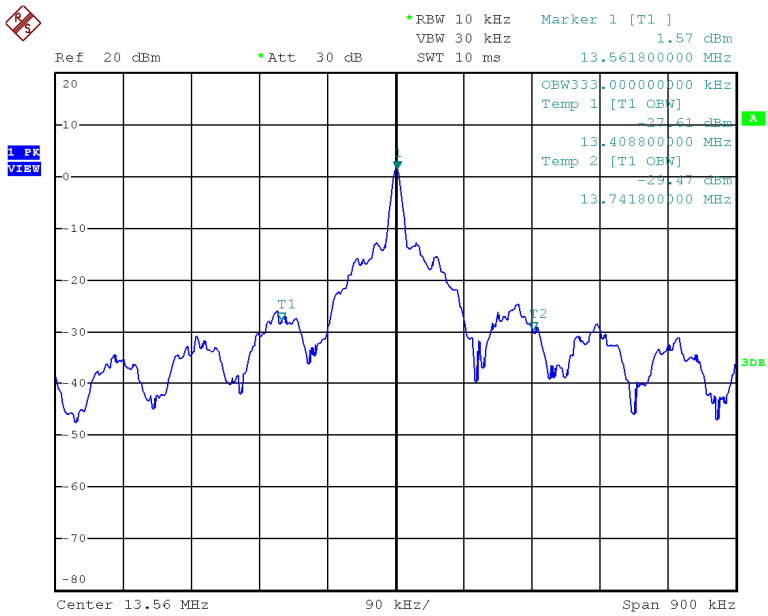


Block diagram of Test setup

Occupied Bandwidth Results:

Frequency (MHz)	Occupied Bandwidth (kHz)
13.56MHz	333

The worst case is shown as below



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9.0 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver (9kHz to 26.5GHz)	Biconical Antenna (30MHz to 300MHz)	Log Periodic Antenna
Registration No.	EW-3156	EW-3242	EW-3243
Manufacturer	ROHDESCHWARZ	EMCO	EMCO
Model No.	ESR26	3110C	3148B
Calibration Date	January 31, 2024	July 30, 2024	July 30, 2024
Calibration Due Date	January 31, 2025	July 30, 2026	January 30, 2026

Equipment	Double Ridged Guide Antenna (1GHz - 18GHz)	Active Loop Antenna (H-field) (9kHz to 30MHz)	RF Preamplifier (9kHz to 6000MHz)
Registration No.	EW-0194	EW-3326	EW-3006b
Manufacturer	EMCO	EMCO	SCHWARZBECK
Model No.	3115	6502	BBV9718
Calibration Date	May 10, 2023	January 05, 2024	October 20, 2023
Calibration Due Date	February 10, 2025	July 05, 2025	January 20, 2025

Equipment	2.4GHz Notch Filter	14m Double Shield RF Cable (9kHz - 6GHz)	RF Cable 14m (1GHz to 26.5GHz)
Registration No.	EW-3435	EW-2376	EW-2781
Manufacturer	MICROWAVE	RADIALL	GREATBILLION
Model No.	N0324413	n m/br56/bnc m 14m	SMA m/SHF5MPU /SMA m ra14m,26G
Calibration Date	September 26, 2023	September 19, 2023	January 16, 2024
Calibration Due Date	March 26, 2025	March 19, 2025	January 16, 2025

Equipment	12 metre RF Cable (1-40)GHz	Pyramidal Horn Antenna
Registration No.	EW-2774	EW-0905
Manufacturer	GREATBILLION	EMCO
Model No.	SMA m-m ra 12m 40G outdoor	3160-09
Calibration Date	January 16, 2024	December 15, 2023
Calibration Due Date	January 16, 2025	June 15, 2025

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2) Bandedge & OBW Measurement

Equipment	EMI Test Receiver (9kHz to 26.5GHz)
Registration No.	EW-3156
Manufacturer	ROHDESCHWARZ
Model No.	ESR26
Calibration Date	January 31, 2024
Calibration Due Date	January 31, 2025

3) Frequency Error Measurement

Equipment	RF Cable 240cm (RG142) (9kHz to 30MHz)	EMI Test Receiver (9kHz to 26.5GHz)	Temperature &Humidity Chamber
Registration No.	EW-2454	EW-3156	EW-2517
Manufacturer	RADIALL	ROHDESCHWARZ	KINGSON
Model No.	Bnc m st / 142 / bnc mra 240cm	ESR26	KTHD-410TBS
Calibration Date	June 13, 2023	January 31, 2024	April 01, 2022
Calibration Due Date	March 13, 2025	January 31, 2025	March 30, 2025

4) Conducted Emissions Test

Equipment	RF Cable 240cm (RG142) (9kHz to 30MHz)	Artificial Mains Network	EMI Test Receiver (9kHz to 3GHz)
Registration No.	EW-2454	EW-3360	EW-3095
Manufacturer	RADIALL	ROHDESCHWARZ	ROHDESCHWARZ
Model No.	Bnc m st / 142 / bnc mra 240cm	ENV-216	ESCI
Calibration Date	June 13, 2023	April 07, 2024	January 18, 2024
Calibration Due Date	March 13, 2025	April 07, 2025	January 18, 2025

5) Control Software for Radiated Emission

Software Information	
Software Name	EMC32
Manufacturer	ROHDESCHWARZ
Software version	10.50.40

END OF TEST REPORT